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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/763,244	01/26/2004	Taishi Kubota	8040-1052	8011

466 7590 11/28/2005

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EXAMINER	
DANG, TRUNG Q	

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 11/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

EK

Office Action Summary	Application No.	Applicant(s)	
	10/763,244	KUBOTA ET AL.	
	Examiner	Art Unit	
	Trung Dang	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 November 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *5 and 11-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *5 and 11-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 January 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 5 and 11 are rejected under 35 U.S.C. 102(b) as being anticipated by Moon et al. (US 5,719,085) of record.

With reference to Figs. 3C-3D, the prior art teaches the claimed invention in that it discloses an oxidation method of a semiconductor substrate having an STI region, comprising the steps of:

etching a semiconductor region to form a trench (Fig. 3C);

preparing dichloroethylene (DCE) (the DCE is utilized in the subsequent oxidation process, hence the DCE has to be prepared); and

subjecting an exposed inside upper end portion of the trench to halogen oxidation with the dichloroethylene and oxygen, whereby a thickness of an oxide corner portion 317 of the semiconductor region adjacent to said upper end portion of the trench is greater than a thickness of said oxide film at other portions of the trench, the halogen oxidation being carried out at temperature of approximately 920°C in an atmosphere within a furnace (Fig. 3D and col. 5, lines 28-50).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 5 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moon et al. as above.

This rejection is made with respect to the claimed temperature range that is not including 920°C.

Moon teaches an oxidation method of a semiconductor device having an STI region as described in the above 102 rejection.

Moon differs from the claims in that while Moon teaches the oxidation is performed at a temperature of approximately 920°C, the claims call for carrying out the oxidation at a temperature between 850 and 950°C.

However, the determination of a temperature range outside that of disclosed by Moon would have been obvious to one of ordinary skill in the art because it is well settle that, absent a showing of criticality or unexpected result by applicant, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable range by routine experimentation. See *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955); *In re Hoeschele*, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); *Merck & Co. Inc. v. Biocraft Laboratories Inc.*, 874 F.2d 804, 10

USPQ2d (Fed.cir), cert. denied, 493 U.S. 975 (1989); *In re Kulling*, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990); and *In re Geisler*, 116 F.3d 1465, 43 USPQ2d 1362 (Fed. Cir. 1997). Furthermore, the specification contains no disclosure of either the critical nature of the claimed temperature range or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen temperatures or upon another variable recited in the claim, the applicant must show that the chosen temperatures are critical. *In re Woodruff*, 919 F.2d, 1575, 1578, 16 USPQ2d, 1936 (Fed. Cir. 1990).

5. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moon et al. as above in view of Chang (US 6,566,224 of record).

Moon teaches a oxidation method of a semiconductor device having an STI region as described in the above 102 rejection.

Moon differs from the claims in not disclosing the concentration of DCE in an oxygen environment within a range as claimed.

In the same field of endeavor, Chang teaches an oxidation process in which sidewalls of an isolation trench are oxidized in an oxidizing environment comprises DCE and oxygen, wherein the concentration of DCE in the oxygen environment is about 1% (col. 5, lines 16-19).

It would have been obvious to one of ordinary skill in the art at the time the

invention was made to modify Moon's process by selecting the concentration of DCE in the oxygen environment of about 1% as suggested by Chang because it is known that oxidation in an ambient containing high concentration of HCl (produced by the chemical reaction of DCE and oxygen) produces facets, thus reducing the DCE concentration would have the benefit of rounding the trench corner while minimizing facets (see col.3, lines 36-45 of Olsen's reference of record. The Olsen reference is cited herein merely for the purpose of showing this fact and not applied in the rejection).

6. Claims 12 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moon et al. as above in view of Chau et al. (US 5,891,809 of record).

Moon teaches a oxidation method of a semiconductor device having an STI region as described in the above 102 rejection.

Moon differs from the claim in not disclosing that the DCE is introduced together with oxygen into the oxidizing furnace by bubbling nitrogen through liquid DCE.

Chau teaches an oxidation process in which the introduction of DCE into the furnace is carried out by bubbling nitrogen through liquid DCE (col. 3, lines 56-61).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Moon's process by introducing the DCE into the furnace using nitrogen as a carrier gas in the bubbling manner as suggested by Chau because such technique of introducing a reactant gas by bubbling an inert carrier gas through a liquid containing the reactant gas is known in the art, and the application of

an old process to perform the same would have been within the level of one skilled in the art.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 13 and 15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 13 and 15 each recites a limitation regarding a proportion of the flow rate of the **oxygen to** the flow rate of **nitrogen** is within a range of 0.45% to 1.97%. This indicates that the flow rate of oxygen is much less than the flow rate of nitrogen. The instant specification at paragraph [0056], however, discloses to the contrary. That is, oxygen flow rate of 20 slm is much greater than nitrogen flow rate of 200 sccm (0.2 slm). The claims are therefore indefinite in that they are unsupported by the specification as originally filed. Since the claims recites a limitation that is not disclosed in the specification, a possible rejection over prior art cannot be made at this time.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Trung Dang whose telephone number is 571-272-1857. The examiner can normally be reached on Mon-Friday 9:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on 571-272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Trung Dang
Primary Examiner
Art Unit 2823

11/22/04